

BEFORE THE
Federal Communications Commission
WASHINGTON, D.C. 20554

In the Matter of)	
)	
Amendment of Parts 2, 25 and 87 of the)	
Commission's Rules to Implement Decisions from)	
World Radiocommunication Conferences)	ET Docket No. 02-305
Concerning Frequency Bands Between 28 MHz)	
And 36 GHz and to Otherwise Update the Rules in)	
This Frequency Range)	
Amendment of Parts 2 and 25 of the)	
Commission's Rules to Allocate Spectrum For)	RM-10331
Government and Non-Government Use in the)	
Radionavigation-Satellite Service)	
To: The Commission		

SUPPLEMENTAL COMMENTS OF LOCKHEED MARTIN CORPORATION

Lockheed Martin Corporation ("Lockheed Martin"), by its attorneys, hereby supplements its February 10, 2003 Comments in the above-captioned proceedings to include in the record the relevant portions of decisions taken at the International Telecommunication Union ("ITU") 2003 World Radiocommunication Conference ("WRC-03") that ended in July of this year. Lockheed Martin has, on this date, separately moved for Commission leave to file these Supplemental Comments.

Among other things, Lockheed Martin updates the record with the WRC-03 output materials pertaining to the conditions for use of the 1164-1215 MHz, 5010-5030 MHz, and 1215-1300 MHz frequency bands by the radionavigation-satellite service ("RNSS"), and urges the Commission to take these results into account as it finalizes its modifications to Section 2.106 of the Rules. This information is significant and timely. The 1164-1215 MHz RNSS band will be

used both by the U.S. Global Positioning System (“GPS”), in which Lockheed Martin has a substantial longstanding interest, and by Lockheed Martin’s own proposed Regional Positioning System (“RPS”), which is a global, geostationary satellite orbit-based augmentation system that is fully compatible with GPS and its augmentations. Lockheed Martin is also seeking authority to use the RNSS (space-to-Earth) allocation at 5010-5030 MHz for RPS. Although Lockheed Martin no longer seeks to include RNSS spectrum in the 1215-1300 MHz band on its proposed RPS system satellites, the band remains in current use on GPS and is an instrumental element in plans for future modernization of the GPS system.

I. INTRODUCTION

As Lockheed Martin explains below, the output materials from WRC-03 on the use of the RNSS band at 1164-1215 MHz ratify the positions Lockheed Martin took in its Comments with respect to the domestic allocation of the full 1164-1215 MHz RNSS band and with respect to the lack of a need for the new footnote – USyyy – that the Commission proposed for inclusion in Section 2.106 of its Rules, 47 C.F.R. § 2.106. The Commission should instead adopt domestically the modifications to international footnote No. 5.328A and associated provisions as approved by WRC-03 in July. The Commission should also implement the now-final ITU allocation actions for the RNSS band at 5010-5030 MHz, which is proposed for use by Lockheed Martin’s RPS system. Finally, GPS uses spectrum in the 1215-1300 MHz band, and the United States Government will include frequencies in this band in future modernizations of the GPS system. As a result, the Commission should also take into account the finalization of the international conditions on the use of the 1215-1300 MHz band as it makes its revisions to Section 2.106 in its forthcoming report and order in ET Docket No. 02-305.

II. DISCUSSION

A. **The Commission Should Incorporate the Results of WRC-03 Regarding RNSS Use of the 1164-1215 MHz Band into its Forthcoming Report and Order.**

In its Comments in response to the notice of proposed rule making in ET Docket No. 02-305, Lockheed Martin challenged the Commission's proposal to limit the domestic implementation of the RNSS spectrum allocated globally in 2000 to the 1164-1189 MHz portion of the 1164-1215 MHz band. Lockheed Martin, which was the petitioner for rule making in the above-captioned proceeding in RM-10331 and which duly sought domestic allocation of the entire 1164-1215 MHz band for RNSS, noted that the Commission's proposal stemmed from a July 2001 request from the National Telecommunication and Information Administration ("NTIA") to defer consideration of the domestic allocation to RNSS of the 1189-1215 MHz band because, *inter alia*, uses for this portion of the allocation had not yet been defined, nor had technical compatibility studies with co-frequency aeronautical radionavigation service ("ARNS") systems been performed. *See* Lockheed Martin Comments, ET Docket No. 02-305/RM-10331, at 9-10 (filed Feb. 10, 2003). Lockheed Martin also observed that circumstances had changed dramatically since July 2001; technical studies of compatibility between RNSS and the ARNS were complete and had resulted in two ITU recommendations on how to protect ARNS across the full band from RNSS emissions, and a consensus was emerging within the ITU on how to assure by regulation the protection of ARNS systems across the 1164-1215 MHz band from the aggregate emissions of all RNSS satellites and systems. *Id.* at 10. Lockheed Martin attached to its Comments the Inter-American Proposals to WRC-03 (to which the U.S. was a signatory) on the subject of the co-existence between RNSS and the ARNS in the 1164-1215 MHz band. *Id.* at 12 n.19 & Attachment 1.

Lockheed Martin is pleased to report that at WRC-03, the U.S.-endorsed proposals for protection of the ARNS at 1164-1215 MHz were adopted largely intact, and that the regulatory measures for assuring the protection of ARNS systems across the 1164-1215 MHz band from RNSS emissions were finalized. Specifically, WRC-03 adopted a modified version of footnote No. 5.328A to the ITU Radio Regulations that mandates that RNSS stations in the whole band shall operate in accordance with new Resolution 609 (which contains the protection criterion for ARNS systems, and is incorporated into the ITU Radio Regulations by new No. 21.18), and specifies that RNSS systems shall not claim protection from ARNS stations. A cosmetic adjustment was also made to the entry in the international Table of Frequency Allocations in Article 5 of the ITU Radio Regulations with which footnote No. 5.328A is associated. Copies of the relevant provisions (i.e., Nos. 5.328A and 21.18, and new Resolution 609 and the associated Recommendation 608) are included in Attachment 1 to these Supplemental Comments, and are incorporated by reference.

Lockheed Martin urges the Commission to include the WRC-03 version of No. 5.328A and its associated table entry in the modification of Section 2.106 that will result from these proceedings. Clearly, the outcome of WRC-03 supports Lockheed Martin's contention that the entire 1164-1215 MHz band should be included in Section 2.106. Any differing treatment would be wholly without technical basis regarding protection of the ARNS. As Lockheed Martin stated in its initial comments:

If the Commission were to allocate the entire band, it would retain maximum flexibility to address authorization questions in individual licensing or letter-of-intent proceedings, to respond rapidly and fully to potential changes in the GPS modernization plans, and to handle on a case-by-case basis requests to operate RNSS in these bands. A decision to adopt domestically the entire WRC-00 allocation to RNSS at 1164-1215 MHz does not prejudice or otherwise prejudice the ability of the Commission (or more broadly, the U.S. Government) to deny RNSS systems access to the 1189-1215 MHz band should there be valid technical

reasons for doing so. The Commission should thus modify Section 2.106 of its Rules to mirror the international allocation table (as shown in the U.S. WRC-03 proposal on Resolution 605).

Lockheed Martin Comments, ET Docket No. 02-305/RM-10331, at 11-12. The outcome of WRC-03, with its treatment of the protection of RNSS from harmful interference by ARNS in No. 5.328A and its treatment of the protection of ARNS from harmful interference by the RNSS in new Resolution 609, confirms Lockheed Martin's previously-stated opinion that the Commission's proposal for new footnote USyyy regarding harmful interference protection is both unnecessary and inherently in conflict with the U.S.-supported actions taken by WRC-03. *Id.* at 12. The Commission thus should not adopt proposed footnote USyyy.

B. The Commission Should Modify Section 2.106 to Implement Domestically the WRC-2000 RNSS Allocation at 5010-5030 MHz.

In addition, to its finalization of issues regarding the use of the 1164-1215 MHz band, WRC-03 took several actions regarding RNSS that have or should have a bearing on the resolution of the instant proceedings. First, WRC-03 finalized the conditions for use by RNSS satellites and systems of the band 5010-5030 MHz. This band was initially adopted at WRC-2000, but, like the 1164-1215 MHz band, was subject to some provisional regulations and further study regarding the protection of other services. WRC-03 accepted the results of ITU studies that have taken place since 2000, and agreed on a set of final regulatory provisions (i.e., newly modified footnote No. 5.443B in Article 5 of the ITU Radio Regulations, and new Resolution 741 (originally adopted as Resolution COM5/1)) for the protection of the radioastronomy service in the 4990-5000 MHz band. No. 5.443B reads as follows:

5.443B In order not to cause harmful interference to the microwave landing system operating above 5 030 MHz, the aggregate power flux-density produced at the Earth's surface in the band 5 030-5 150 MHz by all the space stations within any radionavigation-satellite service system (space-to-Earth) operating in the band

5010-5030 MHz shall not exceed $-124.5 \text{ dB(W/m}^2\text{)}$ in a 150 kHz band. In order not to cause harmful interference to the radio astronomy service in the band 4990-5000 MHz, radionavigation-satellite service systems operating in the band 5010-5030 MHz shall comply with the limits in the band 4990-5000 MHz defined in Resolution [COM5/1] (WRC-03). (WRC-03)

Lockheed Martin, which has included in its RPS Application a request for authority to utilize the RNSS band at 5010-5030 MHz, urges the Commission to include the RNSS allocation made at WRC-2000, with the conditions on the use thereof as revised in modified No. 5.443B by WRC-03, in its forthcoming report and order in ET Docket No. 02-305 revising Section 2.106 of the Commission's Rules. Lockheed Martin believes that the exclusion of this band was an oversight in the initial notice of proposed rule making, and that it can be rectified now without negative procedural consequences. Copies of the portion of the international Table of Frequency Allocations pertaining to the RNSS allocation at 5010-5030 MHz, as finalized by WRC-03, and new Resolution 741 (WRC-03) are included in Attachment 2 to these Supplemental Comments.

C. The Commission Should Conform the Domestic and International Tables of Frequency Allocations for the RNSS in the 1215-1300 MHz Band.

Finally, Lockheed Martin observes that WRC-03 took several actions regarding use of the RNSS band at 1215-1300 MHz. Included among these actions are a modification of footnote Nos. 5.329, 5.331, and 5.334 of the ITU Radio Regulations, and the adoption of new Resolution 608 (initially adopted as Resolution COM5/5). In its Comments, Lockheed Martin supported the removal of the government-use-only restriction on the 1215-1240 MHz band in Section 2.106, and the domestic allocation (government and non-government) of the full 1215-1300 MHz RNSS band as reflected following action taken by WRC-2000. Although Lockheed Martin observes that the outcome of WRC-03's deliberations on the 1215-1300 MHz band are fully consistent with the actions Lockheed Martin proposed, Lockheed Martin has amended its RPS Application to remove its request for authority to operate a non-government RNSS system in the

1215-1300 MHz RNSS band. *See* Amendment of Lockheed Martin Corp. to RPS Application, File No. SAT-AMD-20030730-000149 through 000153 (filed July 30, 2003). Thus, while Lockheed Martin has no present direct RPS interest in the domestic implementation of the allocation actions of WRC-2000 at 1215-1300 MHz, its longstanding GPS interest favors having the Commission conform the RNSS allocation in Section 2.106 of its Rules in the 1215-1300 MHz band (at least Government-only) to the international actions taken at WRC-03. For the reasons elaborated upon in Lockheed Martin's initial Comments and above regarding the consistency of domestic and international treatment of the RNSS allocations at 1164-1215 MHz, there is no articulable basis – and no potential prejudice to future licensing or authorization actions by the Commission or other elements within the United States Government – for maintaining separate treatments for this band. Attachment 3 to these Supplemental Comments contains copies of the WRC-03 actions on the 1215-1300 MHz band (including the modification of Nos. 5.329 and 5.331, and the adoption of new Resolution 608).

III. CONCLUSION


For all of the reasons stated above, Lockheed Martin urges the Commission to incorporate into its rules the relevant outputs of WRC-03 on RNSS matters, to the extent discussed above. These actions are logical outgrowths of the positions articulated at the earlier stages of this proceeding – and either support directly the positions Lockheed Martin advocated in its initial Comments, or complement those positions with related new material. In both cases, accommodating the WRC-03 outputs in the manner proposed here will reduce the long-term burden on the Commission in terms of rulemaking proceedings, especially as the course of action urged by Lockheed Martin should not prove controversial or delay adoption of the forthcoming Report and Order. Moreover, it will serve to show that the Commission is able to move quickly

to implement the outcome of WRCs, something that is of particular benefit in cases such as the RNSS actions, where the WRC outcome was sought and strongly advocated by the United States of America.

Respectfully submitted,

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October 31, 2003

ATTACHMENT 1

WRC-03 Actions on RNSS Use of the 1164-1215 MHz Band*

** Footnote/resolution numbers have been updated to reflect final numbering*

MOD

890-1 260 MHz

Allocation to services		
Region 1	Region 2	Region 3
960-1 164	AERONAUTICAL RADIONAVIGATION 5.328	

MOD

890-1 260 MHz

Allocation to services		
Region 1	Region 2	Region 3
1 164-1 215	AERONAUTICAL RADIONAVIGATION 5.328 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.328A	

MOD 5.328A

5.328A Stations in the radionavigation-satellite service in the band 1 164-1 215 MHz shall operate in accordance with the provisions of Resolution **609 (WRC-03)** and shall not claim protection from stations in the aeronautical radionavigation service in the band 960-1 215 MHz. No. **5.43A** does not apply. The provisions of No. **21.18** shall apply. (WRC-03)

ADD 21.18

Section VI – Protection of aeronautical radionavigation service systems from aggregate emissions of space stations of radionavigation-satellite service systems in the 1 164-1 215 MHz band

21.18 § 7 Administrations operating or planning to operate radionavigation-satellite service systems or networks in the 1 164-1 215 MHz frequency band, for which complete coordination or notification information, as appropriate, was received by the Bureau after 2 June 2000, shall, in accordance with *resolves* 2 of Resolution **609 (WRC-03)**, take all necessary steps to ensure that the actual aggregate interference into aeronautical radionavigation service systems caused by such RNSS systems or networks operating co-frequency in these frequency bands does not exceed the equivalent power flux-density level shown in *resolves* 1 of Resolution **609 (WRC-03)**. (WRC-03)

RESOLUTION 609 (WRC-03)

Protection of aeronautical radionavigation service systems from the equivalent power flux-density produced by radionavigation-satellite service networks and systems in the 1 164-1 215 MHz frequency band

The World Radiocommunication Conference (Geneva, 2003),

considering

- a) that the band 960-1 215 MHz is allocated on a primary basis to the aeronautical radionavigation service (ARNS) in all Regions;
- b) that the band 1 164-1 215 MHz is also allocated on a primary basis to the radionavigation-satellite service (RNSS), subject to the condition in No. **5.328A** that operation of RNSS systems shall be in accordance with this Resolution;
- c) that WRC-2000 provided for implementation of a provisional aggregate power flux-density (pfd) limit during the period between WRC-2000 and WRC-03, and requested ITU-R studies on the need for an aggregate pfd limit, and revision, if necessary, of the provisional pfd limit given in No. **5.328A**;
- d) that this Conference has determined that protection of the ARNS from harmful interference can be achieved if the value of the equivalent power flux-density (epfd) produced by all the space stations of all RNSS (space-to-Earth) systems in the 1 164-1 215 MHz band does not exceed the level of $-121.5 \text{ dB(W/m}^2\text{)}$ in any 1 MHz band;
- e) that only a limited number of RNSS systems are expected to be deployed in the 1 164-1 215 MHz band, and only a few of these systems at most would have overlapping frequencies;
- f) that ARNS systems can be protected without placing undue constraints on the development and operation of RNSS systems in this band;
- g) that to achieve the objectives in *considering f)*, administrations operating or planning to operate RNSS systems will need to agree cooperatively through consultation meetings to equitably share the aggregate epfd in a manner to achieve the level of protection for ARNS systems that is stated in *considering d)*;
- h) that it may be appropriate for representatives of administrations operating or planning to operate ARNS systems to be involved in determinations made pursuant to *considering g)*;
- i) that this Conference has decided to apply the coordination provisions of Nos. **9.12**, **9.12A** and **9.13** to RNSS systems and networks for which complete coordination or notification information, as appropriate, is received by the Bureau after 1 January 2005,

noting

- a) that WRC-2000 invited ITU-R to conduct the appropriate technical, operational and regulatory studies on the overall compatibility between the radionavigation-satellite service and the aeronautical radionavigation service in the band 960-1 215 MHz;
- b) that WRC-2000 resolved to recommend that WRC-03 review the results of the studies,

recognizing

that under No. 7.5 of the Radio Regulations, interested administrations have the ability, at any time, to request the assistance of the Bureau with respect to Articles 9 and 11 and associated procedures,

resolves

1 that in order to protect ARNS systems, administrations shall ensure, pursuant to this Resolution, that the equivalent pfd level produced by all space stations of all RNSS systems does not exceed the level $-121.5 \text{ dB(W/m}^2\text{)}$ in any 1 MHz band;

2 that administrations operating or planning to operate in the 1 164-1 215 MHz frequency band RNSS systems or networks shall, in collaboration, take all necessary steps, including, if necessary, by means of appropriate modifications to their systems or networks, to ensure that the aggregate interference into ARNS systems caused by such RNSS systems or networks operating co-frequency in these frequency bands is shared equitably among the systems identified in *resolves* 3 and does not exceed the level of the aggregate protection criterion given in *resolves* 1 above;

3 that administrations, in carrying out their obligations under *resolves* 1 and 2 above, shall take into account only those RNSS systems with frequency assignments in the band 1 164-1 215 MHz that have met the criteria listed in the Annex to this Resolution through appropriate information provided to the consultation meetings referred to in *considering* g);

4 that administrations, in developing agreements to carry out their obligations under *resolves* 1 and 2 above, shall establish mechanisms to ensure that all potential RNSS system operators and administrations are given full visibility of the process;

5 that in order to allow multiple RNSS systems to operate in the frequency band 1 164-1 215 MHz, no single RNSS system shall be permitted to use up the entire interference allowance specified in *resolves* 1 above in any 1 MHz of the 1 164-1 215 MHz band (see Recommendation 608);

6 that to achieve the objectives in *resolves* 1 and 2 above, administrations operating or planning to operate RNSS systems will need to agree cooperatively through consultation meetings to achieve the level of protection for ARNS systems that is stated in *resolves* 1;

7 that administrations participating in this process of epfd calculation should hold consultation meetings on a regular basis (e.g. yearly);

8 the administrations participating in the consultation meeting shall designate one administration that shall communicate to the Bureau the results of any aggregate sharing determinations made in application of *resolves* 2 above, without regard to whether such determinations result in any modifications to the published characteristics of their respective systems or networks (see Recommendation 608);

9 that administrations operating or planning to operate ARNS systems in the 1 164-1 215 MHz band should participate, as appropriate, in discussions and determinations relating to the *resolves* above;

10 that the methodology and the reference worst-case ARNS system antenna contained in Recommendation ITU-R M.1642 shall be used by administrations for calculating the aggregate epfd produced by all the space stations within all RNSS systems in the band 1 164-1 215 MHz,

instructs the Radiocommunication Bureau

1 to participate in consultation meetings mentioned under *resolves* 6 and to observe carefully results of the epfd calculation mentioned in *resolves* 1;

2 to determine whether the pfd level in *recommends* 1 of Recommendation **608** is exceeded by any subject space station, and to report the findings of this determination to the participants in the consultation meeting;

3 to publish in the International Frequency Information Circular, the information referred to in *resolves* 8 and *instructs the Radiocommunication Bureau* 2,

invites the Radiocommunication Bureau

to examine the possibility, if needed, of developing software that can be used to calculate the equivalent pfd level mentioned under *resolves* 1,

invites administrations

1 to deal with RNSS intersystem matters, as required, as early as possible;

2 to provide the Bureau and all participants of the consultation meeting with access to appropriate software used to calculate the equivalent pfd level mentioned under *resolves* 1.

ANNEX TO RESOLUTION 609 (WRC-03)

Criteria for application of Resolution 609

1 Submission of appropriate Advance Publication information.

2 Entry into satellite manufacturing or procurement agreement, and entry into satellite launch agreement.

The RNSS system or network operator should possess:

i) clear evidence of a binding agreement for the manufacture or procurement of its satellites; and

ii) clear evidence of a binding agreement to launch its satellites.

The manufacturing or procurement agreement should identify the contract milestones leading to the completion of manufacture or procurement of satellites required for the service provision, and the launch agreement should identify the launch date, launch site and launch service provider. The notifying administration is responsible for authenticating the evidence of agreement.

The information required under this criterion may be submitted in the form of a written commitment by the responsible administration.

3 As an alternative to satellite manufacturing or procurement and launch agreements, clear evidence of guaranteed funding arrangements for the implementation of the project would be accepted. The notifying administration is responsible for authenticating the evidence of these

arrangements and for providing such evidence to other interested administrations in furtherance of its obligations under this Resolution.

ADD REC 608

RECOMMENDATION 608 (WRC-03)

Guidelines for consultation meeting established in Resolution 609 (WRC-03)

The World Radiocommunication Conference (Geneva, 2003),

considering

- a)* that in accordance with the Radio Regulations (RR), the band 960-1 215 MHz is allocated on a primary basis to the aeronautical radionavigation service (ARNS) in all the ITU Regions;
- b)* that WRC-2000 introduced a co-primary allocation for the radionavigation-satellite service (RNSS) in the frequency band 1 164-1 215 MHz (subject to the conditions specified under No. **5.328A**), with a provisional limit on the aggregate pfd produced by all the space stations within all radionavigation-satellite systems at the Earth's surface of $-115 \text{ dB(W/m}^2\text{)}$ in any 1 MHz band for all angles of arrival;
- c)* that WRC-03 revised this provisional limit and decided that the level of $-121.5 \text{ dB(W/m}^2\text{)}$ in any 1 MHz for the aggregate equivalent power flux-density (epfd) applying for all the space stations within all RNSS systems, taking into account the reference worst-case ARNS system antenna characteristics described in Annex 2 of Recommendation ITU-R M.1642, is adequate to ensure the protection of the ARNS in the band 1 164-1 215 MHz;
- d)* that WRC-03 decided that to achieve the objectives in *resolves* 1 and 2 of Resolution **609 (WRC-03)**, administrations operating or planning to operate RNSS systems will need to agree cooperatively through consultation meetings to achieve the level of protection for ARNS systems, and shall establish mechanisms to ensure that all potential RNSS system operators are given full visibility of the process but that only real systems are taken into account in the calculation of the aggregate epfd,

recommends

- 1 that in the implementation of *resolves* 5 of Resolution **609 (WRC-03)**, in the frequency band 1 164-1 215 MHz, the maximum pfd produced at the surface of the Earth by emissions from a space station in the RNSS, for all angles of arrival, should not exceed $-129 \text{ dB(W/m}^2\text{)}$ in any 1 MHz band under free space propagation conditions;
- 2 that the RNSS characteristics listed in the Annex, used when applying the methodology contained in Recommendation ITU-R M.1642, as well as the calculated aggregate epfd in $\text{dB(W/m}^2\text{)}$ in each 1 MHz in the range 1 164-1 215 MHz, should be made available in electronic format by the consultation meetings.

ANNEX TO RECOMMENDATION 608 (WRC-03)

List of RNSS system characteristics and format of the result of the aggregate epfd calculation to be provided to BR for publication for information

I RNSS systems characteristics

I-1 RNSS ITU publication reference

RNSS network name	Network ID	ITU Publication reference	IFIC
		AR11/A/...	
		API/A/...	
		AR11/C/...	
		CR/C/...	

I-2 Non-GSO satellite system constellation parameters

For each non-GSO satellite system, the following constellation parameters should be provided to BR for publication for information:

N : number of space stations of the non-GSO system

K : number of orbital planes

h : satellite altitude above the Earth (km)

I : inclination angle of the orbital plane above the Equator (degrees).

Satellite index I	RAAN Ω_{i0} (degrees)	Argument of latitude E_{i0} (degrees)
1
2
...
N

I-3 GSO satellite system longitude

For each GSO satellite system, the satellite longitude should be provided to BR for publication for information, as follows:

LonGSO_i : longitude of each of the GSO satellites (degrees).

I-4 Maximum non-GSO space station pfd versus the elevation angle at the Earth's surface (worst 1 MHz)

For the non-GSO satellite system space stations, the maximum pfd in the worst 1 MHz versus elevation angle should be provided to BR for publication for information in a table format as follows:

Elevation angle (each 1°)	Pfd (dB(W/(m²/MHz)))
–4	pfd (–4°)
–3	pfd (–3°)
...	...
...	...
90	Pfd (–90°)

I-5 Maximum GSO space station pfd versus latitude and longitude at the Earth's surface (worst 1 MHz)

For each GSO satellite system space stations, the maximum pfd in the worst 1 MHz, defined as the 1 MHz in which the pfd of the signal is maximum versus latitude and longitude should be provided to BR for publication for information in a table format as follows:

Longitude (each 1°)	0	1	...	360
Latitude (each 1°)	Maximum pfd dB(W/m²) in worst 1 MHz			
–90	pfd (0, –90)
–89
...
...
90	pfd (360, 90)

I-6 GSO/non-GSO satellite system spectrum

For each GSO and non-GSO satellite system, the level of spectrum emission in each 1 MHz relative to the spectrum value at the worst 1 MHz of the whole band (1 164-1 215 MHz) should also be provided to BR for publication for information.

II Results of the aggregate epfd calculation in the worst MHz of the 1 164-1 215 MHz band

Maximum aggregate epfd in dB(W/m²) in the worst-case megahertz in the range 1 164-1 215 MHz.

ATTACHMENT 2

WRC-03 Actions on RNSS Use of the 5010-5030 MHz Band*

** Footnote/resolution numbers have been updated to reflect final numbering*

MOD

4 800-5 830 MHz

Allocation to services		
Region 1	Region 2	Region 3
5 010-5 030	AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.443B 5.328B 5.367	

MOD

5.443B In order not to cause harmful interference to the microwave landing system operating above 5 030 MHz, the aggregate power flux-density produced at the Earth's surface in the band 5 030-5 150 MHz by all the space stations within any radionavigation-satellite service system (space-to-Earth) operating in the band 5 010-5 030 MHz shall not exceed -124.5 dB(W/m²) in a 150 kHz band. In order not to cause harmful interference to the radio astronomy service in the band 4 990-5 000 MHz, radionavigation-satellite service systems operating in the band 5 010-5 030 MHz shall comply with the limits in the band 4 990-5 000 MHz defined in Resolution **741 (WRC-03)**. (WRC-03)

ADD

RESOLUTION 741 (WRC-03)

Protection of the radio astronomy service in the band 4 990-5 000 MHz from unwanted emissions of the radionavigation-satellite service (space-to-Earth) operating in the frequency band 5 010-5 030 MHz

The World Radiocommunication Conference (Geneva, 2003),

considering

- a)* that unwanted emissions from space stations of the radionavigation-satellite service (RNSS) operating in the frequency band 5 010-5 030 MHz may cause interference to the radio astronomy service (RAS) in the band 4 990-5 000 MHz;
- b)* that WRC-2000 decided to introduce a provisional power flux-density (pfd) limit in the band 4 990-5 000 MHz to protect the RAS, and invited ITU-R to conduct studies to review this limit;
- c)* that protection requirements for the RAS are given in Recommendations ITU-R RA.769 and ITU-R RA.1513, and are different for geostationary (GSO) and non-geostationary (non-GSO) satellite systems,

noting

- a) that Recommendation ITU-R M.1583 provides a methodology based on the equivalent pfd (epfd) concept for calculation of interference resulting from unwanted emissions from non-GSO systems of the mobile-satellite or radionavigation-satellite services into radio astronomy stations;
- b) that Recommendation ITU-R RA.1631 provides antenna patterns and maximum antenna gain to be used for compatibility analyses between non-GSO systems and RAS stations based on the epfd concept;
- c) that Recommendation ITU-R RA.1513 recommends acceptable levels of data loss to radio astronomy observations, stating in particular that the percentage of data loss caused by any system should be lower than 2%,

resolves

- 1 that in order not to cause harmful interference to the radio astronomy service in the band 4 990-5 000 MHz, the pfd produced in this band by any GSO RNSS network operating in the 5 010-5 030 MHz band shall not exceed $-171 \text{ dB(W/m}^2\text{)}$ in a 10 MHz band at any radio astronomy station;
- 2 that in order not to cause harmful interference to the radio astronomy service in the band 4 990-5 000 MHz, over the whole sky, for elevations higher than the minimum operating elevation angle θ_{min} ¹ specified for the radio telescope, the epfd produced in this band by all space stations within any non-GSO RNSS system operating in the 5 010-5 030 MHz band shall not exceed $-245 \text{ dB(W/m}^2\text{)}$ in a 10 MHz band at any radio astronomy station for more than 2% of the time, using the methodology in Recommendation ITU-R M.1583 and a reference antenna with a radiation pattern and maximum antenna gain given in Recommendation ITU-R RA.1631;
- 3 that the limits referred to in *resolves* 1 and 2 shall apply to RNSS systems as from 3 June 2000;
- 4 that administrations planning to operate a GSO or a non-GSO RNSS system in the band 5 010-5 030 MHz, for which complete coordination or notification information, as appropriate, has been received by the Bureau after 2 June 2000, shall send to the Radiocommunication Bureau the value of the maximum level of pfd as referred to in *resolves* 1 or the value of the maximum level of epfd as referred to in *resolves* 2, as appropriate,

instructs the Radiocommunication Bureau

as from the end of WRC-03, to review all RNSS systems for which complete coordination or notification information, as appropriate, has been received by the Bureau before the end of WRC-03 for the band 5 010-5 030 MHz, and, if appropriate, to revise its findings regarding compliance with No. **5.443B**, taking into account additional information received under *resolves* 4.

¹ Until adoption of a definition of θ_{min} by ITU-R, and publication of notified radio astronomy observatory data, a value of 5° should be assumed in appropriate calculations.

ATTACHMENT 3

WRC-03 Actions on RNSS Use of the 1215-1300 MHz Band*

** Footnote/resolution numbers have been updated to reflect final numbering*

MOD

890-1 300 MHz

Allocation to services		
Region 1	Region 2	Region 3
1 215-1 240	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.329 5.329A 5.328B SPACE RESEARCH (active) 5.330 5.331 5.332	

MOD

1 240-1 300	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.329 5.329A 5.328B SPACE RESEARCH (active) Amateur 5.282 5.330 5.331 5.332 5.335 5.335A
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MOD

5.329 Use of the radionavigation-satellite service in the band 1 215-1 300 MHz shall be subject to the condition that no harmful interference is caused to, and no protection is claimed from, the radionavigation service authorized under No. **5.331**. Furthermore, the use of the radionavigation-satellite service in the band 1 215-1 300 MHz shall be subject to the condition that no harmful interference is caused to the radiolocation service. No. **5.43** shall not apply in respect of the radiolocation service. Resolution [COM5/5] (WRC-03) shall apply. (WRC-03)

MOD

5.331 *Additional allocation:* in Algeria, Germany, Saudi Arabia, Australia, Austria, Bahrain, Belarus, Belgium, Benin, Bosnia and Herzegovina, Brazil, Burkina Faso, Burundi, Cameroon, China, Korea (Rep. of), Croatia, Denmark, Egypt, the United Arab Emirates, Estonia, the Russian Federation, Finland, France, Ghana, Greece, Guinea, Equatorial Guinea, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Jordan, Kenya, Kuwait, Lesotho, Latvia, The Former Yugoslav Republic of Macedonia, Liechtenstein, Lithuania, Luxembourg, Madagascar, Mali, Mauritania, Nigeria, Norway, Oman, the Netherlands, Poland, Portugal, Qatar, Syrian Arab Republic, Slovakia, United Kingdom, Serbia and Montenegro, Slovenia, Somalia, Sudan, Sri Lanka, South Africa, Sweden, Switzerland, Thailand, Togo, Turkey, Venezuela and Viet Nam, the band 1 215-1 300 MHz is also allocated to the radionavigation service on a primary basis. In Canada and the United States, the band 1 240-

1 300 MHz is also allocated to the radionavigation service, and use of the radionavigation service shall be limited to the aeronautical radionavigation service. (WRC-03)

MOD

5.334 Additional allocation: in Canada and the United States, the band 1 350-1 370 MHz is also allocated to the aeronautical radionavigation service on a primary basis. (WRC-03)

ADD

RESOLUTION 608 (WRC-03)

Use of the frequency band 1 215-1 300 MHz by systems of the radionavigation-satellite service (space-to-Earth)

The World Radiocommunication Conference (Geneva, 2003),

considering

- a) that WRC-2000 introduced a new allocation for the radionavigation-satellite service (RNSS) in the frequency band 1 260-1 300 MHz;
- b) that the frequency bands 1 215-1 240 MHz and 1 240-1 260 MHz were already allocated to the RNSS;
- c) that, in the band 1 215-1 260 MHz, RNSS (space-to-Earth) systems have been successfully operating for more than 20 years without any reports of interference to the radars which operate in this frequency band;
- d) the importance of the continuing need for protection for the radiodetermination systems operating in the frequency band 1 215-1 300 MHz,

noting

that the provisions of No. **5.329** as adopted by this Conference, will provide for the operation of the RNSS (space-to-Earth) in the frequency band 1 215-1 300 MHz and will protect the radiolocation systems operating in that frequency band, in addition to the protection already provided to radionavigation service systems operating in the countries listed in No. **5.331**,

recognizing

1 that ITU-R carried out studies related to the protection of the radiodetermination systems operating in the frequency band 1 215-1 300 MHz and that these studies should continue pursuant to relevant ITU-R Questions, such as ITU-R 62/8 and ITU-R 217/8, so as to prepare, as appropriate, ITU-R Recommendations;

2 that up to the end of WRC-2000, use of the RNSS in the band 1 215-1 260 MHz was subject only to the constraint that no harmful interference was caused to the radionavigation service in Algeria, Germany, Austria, Bahrain, Belgium, Benin, Bosnia and Herzegovina, Burundi, Cameroon, China, Croatia, Denmark, United Arab Emirates, France, Greece, India, Iran (Islamic Republic of), Iraq, Kenya, the Former Yugoslav Republic of Macedonia, Liechtenstein, Luxembourg, Mali, Mauritania, Norway, Oman, Pakistan, Netherlands, Portugal, Qatar, Senegal,

Slovenia, Somalia, Sudan, Sri Lanka, Sweden, Switzerland, Turkey and Serbia and Montenegro, and, furthermore, that No. **5.43** was applied,

resolves

that no constraints in addition to those in place prior to WRC-2000 (see *recognizing* 2) shall be placed on the use of RNSS (space-to-Earth) frequency assignments in the band 1 215-1 260 MHz brought into use until 2 June 2000,

instructs the Secretary-General

to communicate the contents of this Resolution to the International Civil Aviation Organization (ICAO) for such actions as it may consider appropriate, and to invite ICAO to participate actively in the study activity identified under *recognizing* 1.